MACKENZIE MOUNTAIN
NON-RESIDENT AND NON-RESIDENT ALIEN
HUNTER HARVEST SUMMARY
1998

Northwest Territories Resources, Wildlife & Economic Development

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MACKENZIE MOUNTAIN NON-RESIDENT AND NON-RESIDENT ALIEN HUNTER HARVEST SUMMARY 1998

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ABSTRACT

Data on harvest of big game in the Mackenzie Mountains by non-resident and non-resident alien hunters (collectively called 'non-resident' for this report) were recorded for the 1998 hunting season by each of the eight licenced outfitters that operate in the area and by Renewable Resource Officers with the Department of Resources, Wildlife, and Economic Development. The data recorded included: date(s) of harvest; tags held for each species; horn/antler measurements for Dall's sheep, woodland (mountain) caribou, moose, and mountain goats; age of Dall's sheep; location of kill sites; hunter effort; sex of mountain goats, wolves, wolverines, and black bears harvested; numbers of animals observed for each species (including grizzly bears); and a subjective rating of the overall hunting experience by each hunter.

Non-resident licences were bought by 345 hunters in 1998. Hunters from outside Canada (non-resident aliens) comprised 80% of all outfitted hunters in the Mackenzie Mountains and Canadians from outside the NWT, or NWT residents with less than 2 years residency (non-residents) comprised 20%. Of the 345 non-resident licence holders, 341 came to the N.W.T. and most spent at least some time hunting. *Outfitter Return on Client Hunter Success* forms were submitted for 333 non-resident licence holders in 1998. *Hunter Wildlife Observation Report* forms were voluntarily submitted by 206 non-resident hunters.

Tags to hunt Dall's sheep were purchased by 246 non-resident hunters and they harvested 215 rams. The average age of rams harvested was 10.0 $\pm$ 1.5 years. Hunters' observations gave estimates of 60 lambs and 84 rams per 100 ewes, respectively. Hunters reported seeing an average of 10.4 legal rams (horns at least ¾ curl) during their hunts. Tags to hunt woodland caribou were purchased by 223 non-resident hunters and they harvested 160 animals. Hunters' observations gave estimates of 36 caribou calves and 34 bulls per 100 cows, respectively. Non-resident hunters purchased 69 moose tags and harvested 52 bulls. We calculated estimates of 30 moose calves and 95 bulls per 100 cows, respectively, from hunters' reported observations. Five mountain goats were harvested by the 23 non-residents that purchased tags, 9 wolves by 165 tag-holders, and no wolverines were taken by 99 tag-holders. Two tags were purchased for black bears, but no animals were harvested.

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INTRODUCTION

The 140,000 km^2 (34.6 million acres) area of the Mackenzie Mountains in the western Northwest Territories (NWT) were opened for sport hunting in 1965 (Simmons 1968) and over the last three decades the Mackenzies have become known to big game hunters around the world for the high quality wilderness experience they offer (Veitch and Simmons 1999). In return, non-resident hunters in the Mackenzie Mountains contribute $1,800,000 annually to individuals, businesses, and governments in the NWT (Crapo 1997). The non-resident hunting industry in the Mackenzie Mountains also provides annual employment for 100 to 120 outfitters, guides, pilots, camp cooks, camp helpers, and horse wranglers (Kelly Hougen, Association of Mackenzie Mountain Outfitters, personal communication).

Eight outfitters are currently licenced to provide big game outfitting services within the Mackenzie Mountains, NWT (Figure 1; Appendix 2); however, no hunting is permitted within the boundaries of Nahanni National Park in the southern portion of the range. Each licenced outfitter has the exclusive privilege to provide services within their zone, which enhances the outfitters' ability to practice sustainable harvest through annual allocation of the harvest effort.

There are four classes of licenced big game hunters in the NWT:

1) *general* – subsistence harvesters, primarily aboriginal people.

2) *resident* - Canadian citizens or landed immigrants who have lived in the NWT for at least two consecutive years prior to application for the licence;

2) *non-resident* - Canadian citizens or landed immigrants who live outside the NWT, or have not lived within the NWT for two consecutive years prior to application for the licence; and

3) *non-resident alien* - non-Canadian citizens or landed immigrants.

All holders of big game hunting licences must be at least 16-years-old. Both non-residents and non-resident alien hunters must use the services of an outfitter and must be accompanied by a licenced guide at all times while hunting. For simplification in this report, we call both non-resident and non-resident alien hunting licence holders 'non-residents' and combine their harvest statistics.

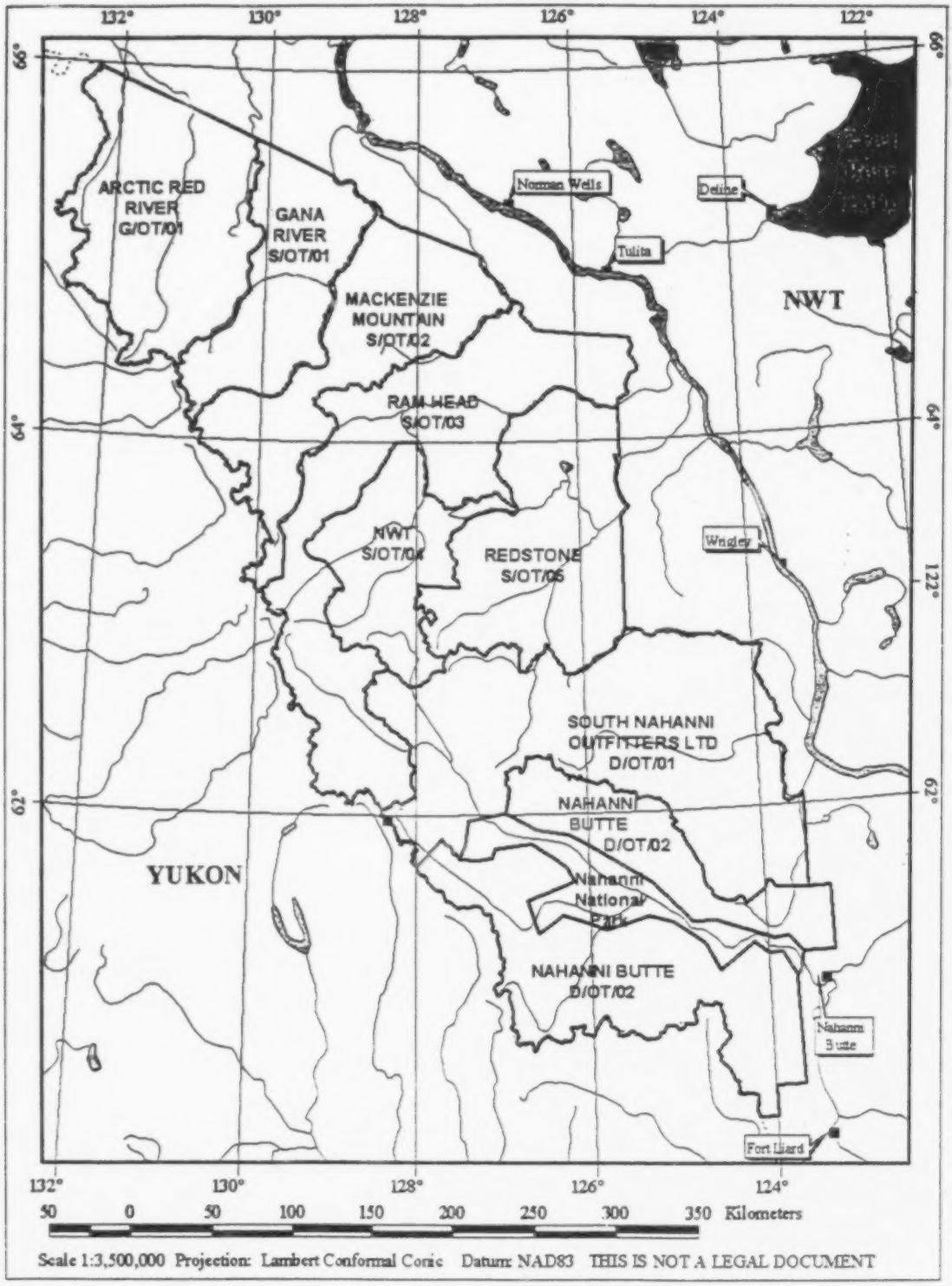

Figure 1. Outfitting zones in the Mackenzie Mountains, NWT - 1998

The Department of Resources, Wildlife, and Economic Development (DRWED) in Norman Wells (Sahtu Region) annually monitors non-resident big game harvest in the Mackenzie Mountains. Seasons for each big game species vary slightly and the total non-resident hunting season lasts from 15 July to 31 October. There are currently no restrictions on the numbers of Dall's sheep, woodland caribou, mountain goats, moose, wolves, wolverine, and black bears that each outfitter can take within their zone.

Individual non-resident hunters are annually restricted to one each of the following big game species: Dall's sheep (male with at least ¾ curl horns), woodland caribou (either sex), moose (either sex), mountain goat (either sex), wolf (either sex), wolverine (either sex), and black bear (adult not accompanied by a cub or cubs). Non-resident hunting for grizzly bears was closed in 1982 as a result of concerns about over-harvest (Miller et al. 1982; Latour and MacLean 1994).

Each year the DRWED, under provisions laid out in the Northwest Territories *Wildlife Act*, requires that outfitters submit an *Outfitter Return on Client Hunter Success* for each person that purchased a NWT non-resident big game hunting licence (Figure 2). These forms (known as *Outfitter Returns)* must be submitted whether or not a client actually hunted, and whether or not any game was harvested.

The *Outfitter Returns* provide a basis to annually monitor the activities of non-resident hunters in the Mackenzie Mountains and to help ensure that the harvest of each species is within sustainable limits (Latour and MacLean 1994; Veitch and Popko 1996; Veitch and Popko 1997; Veitch and Simmons 1998). In addition to the *Outfitter Returns*, we request all non-resident hunters to voluntarily provide reports of the wildlife they saw during their hunts. These data are recorded on a separate form, the *Hunter Wildlife Observation Report* (Figure 3).

This is the fourth consecutive year that a summary of the data collected by DRWED on non-resident hunters in the Mackenzie Mountains has been made (Veitch and Popko 1996, 1997; Veitch and Simmons 1998). We hope that the information is of interest and use to outfitters and their staff, communities, land claim settlement area wildlife co-management boards, hunters, people involved in promotion of tourism in the NWT, other biologists, and to anyone else with an interest in the Mackenzie Mountains.

METHODS

Prior to the start of the 1998 hunting season, each outfitter in the Mackenzie Mountains received sufficient copies of the *Outfitter Return* and *1998 Hunter Wildlife Observation Report* (*Observation Report*) forms for all their clients for the year. The *Wildlife Business Regulations* require *Outfitter Returns* to be returned by the tenth day of the month following the month of the hunt – e.g., for a hunter that was in the field in July, a form must be submitted by the 10th of August. Those forms, and the voluntary *Observation Reports*, were submitted to the senior author whether or not a client actually hunted and whether or not harvest occurred. In co-operation with Renewable Resource Officers with DRWED and the outfitters, persistent attempts were made to obtain *Outfitter Returns* for every non-resident that held a big game hunting licence through a Mackenzie Mountain outfitter in 1998.

Where an *Observation Report* form was received, we recorded wildlife observations directly from the form. When no *Observation Report* was received, but observation data were recorded on the *Outfitter Return*, we entered the data from the *Outfitter Return*.

Once received, data from the outfitter returns were cross-checked with the DRWED *Game Licencing* central database maintained in Yellowknife, with GNWT wildlife *Export Permit* forms, and with records of sequentially numbered, unique identifier plugs inserted in the horns of legally harvested rams maintained by DRWED offices across the western NWT. After verification, all data were entered onto an *Excel 5.0* (Microsoft Corporation, Seattle, WA) spreadsheet for analyses.

DEPARTMENT OF RENEWABLE RESOURCES
PURSUANT TO THE WILDLIFE ACT

OUTFITTER RETURN ON CLIENT HUNTER SUCCESS

MINISTÈRE DES RESSOURCES RENOUVELABLES
LOI SUR LA FAUNE

RAPPORT DU POURVOYEUR SUR LES RÉSULTATS DE CHASSE D'UN CLIENT

OR XXXXX

INSTRUCTIONS

This form is to be completed as soon as practicable after the big game animal has been killed and is to be submitted before the 10th day of the following month to the Regional Biologist at:
Ce formulaire doit être rempli aussitôt que possible après l'expédition de gros gibier et doit être remis au biologiste régional avant le dixième jour du mois suivant à :

Address - Adresse | Community - Communauté | Postal Code (postal) | NT

OUTFITTER/CLIENT HUNTER - POURVOYEUR/CLIENT CHASSEUR

Outfitter Name - Nom du pourvoyeur | Client Hunter Last Name - Nom de famille du client chasseur | First Name - Prénom | Initial | Hunting Lic. No. - N° du permis de chasse

RETURN FOR THE PERIOD OF - RAPPORT MENSUEL POUR

Month: Mois : | Year: Année :

BIG GAME HUNTED - GROS GIBIER CHASSÉ (If none killed, complete "No. of Days Hunted" for each species hunted - Si aucun animal n'a été abattu, remplir la partie «Nombre de jours à la chasse» pour chaque espèce chassée.)

Species - Espèce	Tag No. - N° de l'étiquette	No. of Days Hunted - Nombre de jours à la chasse	Guide Name - Nom du guide	Guide Lic. No. - N° du brevet du guide	Kill Date - Date de la mise à mort (D / J)	(M / M)	Antler Length - Longueur des bois (Right - Droite)		Antler Spread - Écartement des bois		Comments - Observations
WOODLAND CARIBOU CARIBOU DES BOIS											Right Antler Length - Longueur du bois droit : cm Left Antler Length - Longueur du bois gauche : cm
MOOSE ORIGNAL											Widest Antler Spread - Largeur du ponceau (au plus large) : cm
MOUNTAIN GOAT CHÈVRE DE MONTAGNE											Right Horn Length - Longueur du bois droit : cm Left Horn Length - Longueur du bois gauche : cm Sex - Sexe
POLAR BEAR OURS POLAIRE											Hide Length - Longueur de la peau : Pelt Hide - Peau brute Sex - Sexe
BARREN-GROUND CARIBOU CARIBOU DE LA TOUNDRA											9a. Bear - Ours Sex - Sexe
Other, specify - Autre, préciser											b. Bear - Ours Sex - Sexe
Other, specify - Autre, préciser											c. Bear - Ours Sex - Sexe
Other, specify - Autre, préciser											d. Bear - Ours Sex - Sexe
Other, specify - Autre, préciser											e. Bear - Ours Sex - Sexe
DALL'S SHEEP MOUFLON DE DALL											f. Bear - Ours Sex - Sexe

FICH ONLY CERVEAU BUREAU

COMMENTS - COMMENTAIRES

We are interested in your observations of quantity and quality of wildlife observed (year location, condition, age, sex species, etc. In addition, please comment on any unusual conditions (i.e. scars, behavior, etc.) on the harvested animals.
Nous sommes intéressés par les observations que vous avez faites sur la quantité et la qualité de la faune, en localisation, en condition, l'âge, le sexe, les espèces, etc. De plus, vous pouvez faire des commentaires sur les conditions inhabituelles observées sur des animaux abattus (cicatrices, comportement, etc.).

OFFICE USE ONLY - RÉSERVÉ AU BUREAU

Export Permit No. - N° du permis d'exportation | Export Permit No. - N° du permis d'exportation | Case Permit No. - N° du permis CITES

Checked By - Vérifié par | Date (d-m-m-y-y)

Entered By - Inscrit par | Date (d-m-m-y-y)

NOTE: This form must be kept up to date and all records relating to the Outfitter Return are subject to inspection by a Wildlife Officer. It is an offence to give false or misleading information in this return.

NOTE : Cette formule doit être à jour. Un agent de la faune a le plein pouvoir de vérifier la justesse de tout ce qui est inscrit sur le rapport du pourvoyeur. Inscrire des renseignements faux ou trompeurs sur ce formulaire constitue une infraction.

Signature : | Date :

Pourvoyeur - Outfitter

1. HEADQUARTERS - ADMINISTRATION CENTRALE 2. REGION - RÉGION 3. DISTRICT 4. LICENCE HOLDER - DÉTENTEUR DU PERMIS

1.

Figure 2. 1998 Mackenzie Mountain *Outfitter Report* form.

MACKENZIE MOUNTAINS, N.W.T.

HUNTER OBSERVATION REPORT - 1998

The following information is requested in order to assist management of Mackenzie Mountain big game populations. The requested information is voluntary and your providing it to us is most appreciated.

HUNTER INFORMATION

Last Name	First Name and Initials	
Address - number and street, box number	Town, City	Province, State, Country

Hunting Licence# _____ Oufitting Zone: _____ Company: _____
Start Date of Hunt _____ 1998 End Date of Hunt _____ 1998 Observations Made Over __ Days

ESTIMATED NUMBER OF DALL'S SHEEP SEEN			
¾ and Full Curl Rams	Less than ¾ Curl Rams	Ewes	Lambs

ESTIMATED NUMBER OF WOODLAND CARIBOU SEEN		
Bulls	Cows	Calves

ESTIMATED NUMBER OF MOOSE SEEN		
Bulls	Cows	Calves

ESTIMATED NUMBER OF MOUNTAIN GOATS SEEN			
Billys	Nannys	Kids	Unknown Age

OTHER SPECIES

	Wolf	Wolverine	Black Bear		Grizzly Bear	
			Adult	Cub	Adult	Cub
Number Seen						

How would you rate your overall hunting experience in the Mackenzie Mountains?
Excellent _____ Very Good _____ Good _____ Fair _____ Poor _____
Was this your first time hunting the Mackenzie Mountains? _____ Yes _____ No
If no, how many times have you hunted in the Mackenzie Mountains before 1998? _____
If yes, will you return to hunt the Mackenzie Mountains again? Yes _____ No _____
Do you feel that grizzly bears are a problem in the Mackenzie Mountains?
Yes _____ No _____ Neutral _____

Comments: (continue on reverse if necessary)

Figure 3. 1998 Mackenzie Mountain *Hunter Observation Report* form.

RESULTS and DISCUSSION

Hunters

Big game hunting licences for the Mackenzie Mountains, NWT were bought by 345 non-resident hunters in 1998. Of those, at least 341 (99%) came to the NWT and spent some time hunting; 4 either cancelled their hunts or decided not to hunt after arriving in the NWT. Licence sales in 1998 were down 2% from 1997 (Veitch and Simmons 1998). As in 1997, there was an overall decline in non-resident licence sales to Canadian citizens (i.e., non-residents) compared to previous years (Table 1). Seventeen percent of all licences sold in both 1997 and 1998 were to non-residents, whereas from 1979 to 1990 the annual average was 22% (Latour and MacLean 1994; Veitch and Simmons 1998); in 1996 non-resident sales accounted for 24% of all licences (Veitch and Popko 1997). The decline over the last two years is possibly a result of a sharp decrease in the value of the Canadian dollar versus its US counterpart after 1996, since outfitters charge clients in $US.

We received mandatory *Outfitter Returns* for 333 (97%) non-resident hunters. Voluntary *Hunter Observation Reports* were received from 60% of the 341 hunters who spent some time hunting in the Mackenzie Mountains in 1998. On the *Hunter Wildlife Observation Report* each hunter was asked to rank his or her experience in the Mackenzie Mountains from poor to excellent (Figure 3; Table 2). Responses were received from 202 hunters (98% of hunters that submitted *Observation Reports*) and 97% expressed a high degree of satisfaction with their outfitter and their Mackenzie Mountain hunting experience (Table 2). It was the first time in the Mackenzie Mountains for 147 of 199 (74%) hunters that indicated the number of times they have hunted the region; the 52 repeat hunters (26%) had hunted from 2 to 7 times previously. Of the 147 hunters that answered our question about their plans to return to the Mackenzies to hunt in the future, 140 (96%) indicated they would like to return.

As in 1996 and 1997 (Veitch and Popko 1997; Veitch and Simmons 1998), the hunters' comments express considerable dissatisfaction at the inability to hunt for grizzly bears and about problems encountered with bears, such as losing meat, capes, or both, to bears in and around camps. All comments received are provided in Appendix 1.

Table 1. Province or country of origin for 345 non-resident hunters in the Mackenzie Mountains, 1998.

Canada		United States		Europe		Other	
NWT/Yukon	1	Eastern States[1]	123	Austria	2	Mexico	2
British Columbia	19			Australia	2	Unknown	19
Alberta	35	Western States[2]	119	Germany	9		
Saskatchewan	5			Italy	3		
Manitoba	1	State Unknown	1				
Ontario	4						
Quebec	0						
Atlantic Provinces	0						
Total	65		243		16		21

[1] AL, AR, CT, DE, DC, FL, GA, IL, IN, IA, KY, LA, ME, MD, MA, MI, MN, MS, MO, NH, NJ, NY, NC, OH, PA, PR, RI, SC, TN, VT, VA, VI, WV, WI

[2] AK, AZ, CA, CO, HI, ID, KS, MT, NB, NV, NM, ND, OK, OR, SD, TX, UT, WA, WY

Table 2. Satisfaction ratings reported by non-resident hunters in the Mackenzie Mountains, 1998.

Ranking	Number of Responses	Percent of All Responses
Excellent	161	79.7
Very Good	35	17.3
Good	4	2.0
Fair	1	0.5
Poor	1	0.5

Dall's Sheep (*Ovis dalli dalli)*

Tags to hunt Dall's sheep were purchased by 71% (N = 246) of non-resident hunters. This compares to 72% in 1997 (Veitch and Simmons 1998) and is up from 64-65% in the 1995 and 1996 seasons (Veitch and Popko 1996, 1997). At least 91% of sheep tag holders pursued Dall's sheep and they harvested 215 rams. The average length of a sheep hunt was 4.4 $\pm$ 2.8 days, similar to 4.3 $\pm$ 2.6 in 1997, but a slight decrease from 5.0 $\pm$ 3.0 days in 1996, 5.1 $\pm$ 2.9 days in 1995, and the 5.3 day average reported for the period 1979 to 1990 (Latour and MacLean 1994).

The non-resident sheep harvest comprises at least 90% of the total annual harvest of Dall's sheep in the Mackenzie Mountains and removes only 0.8 to 1.5% of the estimated 14,000 to 26,000 Dall's sheep in the Mackenzie Mountains (Veitch and Simmons 1999). It appears the current harvest level is sustainable provided that hunting pressure is distributed evenly across each of the zones. In the Yukon Territory - where harvest is managed by a full curl rule - thinhorn sheep managers have set the sustainable harvest at 4% of the non-lamb population (Yukon Renewable Resources 1996). In those areas of the Yukon where the management objective is to increase population size, harvest is limited to 2% of the total population.

The average age of rams taken by non-residents in 1998 was 10.0 $\pm$ 1.5 years (range 5.5 to 15.5 years), which matches 1997 as the highest average since 1967-68 (Appendix 3). One hundred and nine (53%) of 207 aged rams were 10 or more years-old (Table 6). This is the first hunting season in which the majority of animals taken were at least 10-yr-old.

There has been remarkable consistency from 1979 to 1998 in the mean outside contour length of the right horns from rams harvested by non-residents (Appendix 3), which is surprising given the increase in average age during that same period. We expect to see more broomed, or broken, horn tips on older animals, since horn breakage generally occurs as a result of fights between rival males (Geist 1993). In 1998, brooming was noted on 24% (50 of 208) of left and 31% (65 of 208) of right horns.

Table 3. Horn measurements of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 1998.

	Left Horn Contour Length		Right Horn Contour Length		Left Horn Base Circumference		Right Horn Base Circumference		Tip to Tip Spread	
	cm	in	cm	in	cm	in	cm	in	cm	in
Mean	90.5	35.6	90.0	35.4	33.4	13.1	33.5	13.2	60.3	23.7
Standard deviation	7.7	3.0	7.7	3.0	2.2	0.9	2.3	0.9	10.1	4.0
Maximum	108.0	42.5	111.5	43.9	48.5	19.1	48.5	19.1	89.0	35.0
Minimum	63.5	25.0	63.5	25.0	29.0	11.4	29.0	11.4	36.5	14.4

Each year we ask hunters to report their observations of numbers and age/sex classes of sheep to assist in assessing population dynamics of Dall's sheep in the Mackenzie Mountains. From hunters' observations of 2698 lambs and 4526 ewes, we calculated an estimate of 60 lambs per 100 ewes, which is similar to the 57 per 100 reported in 1997 (Veitch and Simmons 1998) and an increase from 44 per 100 in 1996 (Veitch and Popko 1997). For the Richardson Mountains of the northern Yukon and NWT, Nagy and Carey (1991) suggest an August lamb: ewe ratio of 43 per 100 would allow their observed 10.5% average annual rate of increase from 1986 to 1991. Jorgenson (1992) summarized 17 years of lamb: ewe classification data for a herd of bighorn sheep in westcentral Alberta and found a mean of 43 lambs per 100 ewes in September (range 25 to 54 per 100). Veitch and Popko (1998) summarized ground-based classification and census data from four study areas in the north and northcentral Mackenzie Mountains (total area 1409 km^2); they estimated an average of 82 lambs per 100 ewes for mid-June surveys in 1998.

The ram to ewe ratio calculated from hunters' observations in 1998 was 84 per 100 - a sharp increase from the 55 per 100 in 1997 (Veitch and Simmons 1998), but similar to the 82 rams per 100 ewes reported by hunters in 1996 (Veitch and Popko 1997). Veitch and Popko (1998) documented ram to ewe ratios from 60 to 76 rams per 100 ewes for their four study

areas, with a cumulative ratio of 65 rams per 100 ewes. In the Yukon, 26 years of aerial surveys (1973-1998) to count and classify sheep have given an average of 48 rams per 100 'nursery sheep' (i.e., yearlings and ewes combined), with a range of 28 to 74 rams per 100 nursery sheep (Jean Carey, unpublished data, Yukon Dept. of Renewable Resources). The Yukon's ratio in 1998 was 37 rams per 100 nursery sheep. In Alaska, ram to ewe ratios for two unhunted herds in Denali and Gates of the Arctic national parks typically average 60-67 rams per 100 ewes (Nichols and Bunnell 1999). In more heavily hunted Alaskan herds, ram to ewe ratios range from 33: 100 (heavily hunted) to 87: 100 (lightly hunted).

Differences in adult sex ratios among populations may result from differences in hunting pressure, differences in survival of males and females from birth to adulthood, or both (Nichols and Bunnell 1999). However, since the ratio of rams to ewes is never equal, even in unhunted populations, it is clear that there is a different natural mortality rate for the two sexes. Geist (1971) suggested that this difference is a result of injuries and stress accumulated by males during the breeding season.

Table 4. Dall's sheep observations reported by non-resident hunting licence holders in the Mackenzie Mountains, 1998.

	Number of hunters reporting	Number observed	Mean number observed	Percent of sheep classified
Rams	181	3790	20.9	34.4
Ewes[1]	183	4526	24.7	41.1
Lambs	175	2698	15.4	24.5
Unknown	1	5	5.0	n/a

[1] includes females >1-yr-old, yearlings, and younger rams. Also called 'nursery sheep'.

In 1997, hunters reported seeing a mean of 7.5 legally harvestable rams each (205 hunters reporting) and 49% of all rams observed were ≥ ¾ curl (Veitch and Simmons 1998). The 177 hunters that reported observations in 1998 saw a mean of 10.4 legal rams. As in 1997, 49% of all rams seen were legally harvestable (Table 5). In their four study areas, Veitch and Popko (1998) reported that 46% of rams classified were legally harvestable.

Table 5. Classification of Dall's sheep rams observed by non-resident hunters in the Mackenzie Mountains, 1998.

Ram class	Number of hunters reporting	Number classified	Mean number observed/hunter	Percent of rams classified
Horns ≥ ¾ curl	177	1843	10.4	48.9
Horns < ¾ curl	171	1924	11.3	51.1

Table 6. Age-structure of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 1994-98.

	1998		1997		1996		1995		1994	
Age	No.	%	No.	%	No.	%	No.	%	No.	%
3	0	0.0	0	0.0	1	0.5	0	0.0	0	0.0
4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5	1	0.5	0	0.0	1	0.5	1	0.5	0	0.0
6	4	2.0	1	0.5	5	2.5	4	2.1	7	3.7
7	9	4.3	12	5.8	21	10.5	16	8.5	32	16.8
8	39	18.8	39	18.8	47	23.5	49	25.9	36	18.8
9	45	21.7	52	25.1	56	28.0	51	27.0	42	22.0
10	63	30.4	58	28.0	36	18.0	34	18.0	43	22.5
11	30	14.5	24	11.6	26	13.0	14	7.4	17	8.9
12	12	5.8	15	7.2	6	3.0	14	7.4	10	5.2
13	2	1.0	4	1.9	1	0.5	5	2.6	0	0.0
14	1	0.5	2	1.0	0	0.0	1	0.5	4	2.1
15	1	0.5	0	0.0	0	0.0	0	0.0	0	0.0
>10-yrs	109		102		69		68		74	
%>10-yrs	52.6		49.5		34.5		36.0		38.7	
>12-yrs	16		21		7		20		14	
%>12-yrs	7.7		10.1		3.5		10.6		7.3	

Woodland Caribou (*Rangifer tarandus caribou)*

Tags to hunt woodland caribou were purchased by 65% (N = 223) of non-resident hunters. At least 80% of tag holders hunted caribou and they harvested 160 animals, down slightly from the 168 taken in 1997 and 172 in 1996 (Veitch and Popko 1997; Veitch and Simmons 1998). The average length of a woodland caribou hunt was 4.0 $\pm$ 2.9 days and ranged from 1 to 16 days.

Table 7. Antler measurements of woodland caribou bulls harvested by non-resident hunters in the Mackenzie Mountains, 1998.

	Contour length (cm)		Antler spread (cm) (tip to tip)
	Left antler	Right antler	
Number measured	106	106	9
Mean (average)	114.2	113.9	82.8
Standard deviation	13.0	12.7	15.8
Maximum	148.0	142.5	95.3
Minimum	67.0	72.0	45.0

The overall mean right antler length of caribou harvested by non-residents (Table 7) was down slightly from the 116.2 cm (45.7") recorded in 1997 (Veitch and Simmons 1998). The maximum length and spreads recorded in 1998 (142.5 and 95.3 cm (56.1" and 37.5"), respectively) were also down from 164.0 cm (64.6") and 114.5 cm (45.1") in 1997.

Table 8. Woodland caribou observations reported by non-resident hunters in the Mackenzie Mountains, 1998.

Age/sex class	Number of hunters reporting	Number observed	Mean number observed/hunter	Percent of total classified
Bulls	196	5727	29.3	20.2
Cows	191	16,650	87.2	58.6
Calves	182	6025	33.2	21.2

From hunters' observations of 28,402 woodland caribou, we calculated ratios of 36 calves and 34 bulls per 100 cows. This compares to 36 calves and 21 bulls per 100 cows in 1997 (Veitch and Simmons 1998). Bulls comprised 20% of all caribou classified – up from a low of 13% in 1997 (Veitch and Simmons 1998). Bergerud (1978) summarized data for eight North American caribou populations that were either non-hunted or hunted non-selectively (i.e., both males and females included in the harvest) and documented a cumulative average bull component of 39%. Therefore, the situation in the Mackenzie Mountains needs to be more fully investigated and a proposal to initiate a study of woodland caribou in the central and northcentral Mackenzie Mountains (MacDonald and Veitch 1999) was approved by the Sahtu Renewable Resources Board in March 1999.

Moose (*Alces alces)*

Tags to hunt moose were purchased by 20.0% (N = 69) of non-resident hunters, which is similar to previous years. At least 78% of tag holders hunted moose and they harvested 52 bulls – the second highest total since 1991 (Appendix 5). Moose hunts averaged 4.0 $\pm$ 2.8 days and ranged from 1 to 14 days.

The mean tip-to-tip spread of 36 measured antlers was 142.4 $\pm$ 15.9 cm (56.1 $\pm$ 6.3") from bull moose harvested by non-residents in 1998 was down slightly from the 147.2 cm (58.0") recorded in 1997 but similar to the 143.7 cm (56.6") in 1996 (Veitch and Popko 1997) and 142.4 cm (56.1") in 1995 (Veitch and Popko 1996). The maximum recorded moose antler spread in 1998 was 167.8 cm (66.1").

Table 9. Moose observations reported by non-resident hunters in the Mackenzie Mountains, 1998.

Age/sex class	Number of hunters reporting	Number observed	Mean number observed/hunter	Percent of total classified
Bulls	156	373	2.4	42.3
Cows	157	392	2.5	44.4
Calves	144	117	0.8	13.3

From hunters' observations (Table 9) we calculated ratios of 30 calves and 94 bulls per 100 cows. This is the fourth consecutive year (Appendix 6) in which moose calf: cow ratios have been considerably lower than the 40 to 60 calves per 100 cows documented in early winter aerial surveys along the Mackenzie River in the vicinity of the communities of Fort Good Hope (MacLean 1994a), Norman Wells (Veitch et al. 1996), and Tulita (MacLean 1994b). No biological surveys of moose have ever been done in the Mackenzie Mountains and we have no explanation for the apparent discrepancy in calf production/survival between the mountains and the river valley.

Mountain Goat (*Oreamnos americanus*)

Mountain goat tags were purchased by 7% (N = 23) of non-residents. At least 9 tag holders hunted mountain goats and they harvested 5 animals (four males and one female). All 5 harvested goats were from outfitting zone D/OT/01. Goat hunts ranged from 1 to 6 days and averaged 2.6 $\pm$ 2.1 days. No hunters reported observations of mountain goats in 1998. In previous years the only three zones that have had reports of mountain goats have been G/OT/01, G/OT/02, and S/OT/04 (Veitch and Popko 1997; Veitch and Simmons 1998).

The mean right and left horn lengths of goats harvested in 1998 were 18.2 cm (7.2") and 19.5 cm (7.7"), respectively. The longest recorded horn length was 23.5 cm (9.3").

Carnivores

Wolf (Canis lupus)

Wolf tags were purchased by 48% (N = 165) of non-resident licence holders. At least 34% of tag holders hunted and they harvested 9 wolves. Wolf hunts averaged 6.2 $\pm$ 3.4 days.

In comparison with 1996 and 1997, observations of wolves in 1998 were down considerably. One hundred and forty-eight non-resident hunters recorded whether or not they had seen wolves - of those, 57 (38%) observed at least one wolf and a total of 148 wolves was recorded. Wolves were reported from seven zones - no wolves were reported from D/OT/02. In 1997, a total of 203 wolves was reported by 141 hunters, of whom 77 (55%) saw at least one

wolf (Veitch and Simmons 1998). However, even that was a reduction from 1996 when 76 hunters, of whom 82% saw at least one, reported a total of 186 wolves. As shown in Appendix 5, harvest of wolves in 1998 was also down by 5 to 8 animals from the previous four years.

Wolverine (Gulo gulo)

Wolverine tags were purchased by 29% (N = 99) of non-resident hunters. At least 34 tag holders hunted wolverines; however, they harvested no animals. The average length of a wolverine hunt was 7.3 $\pm$ 3.2 days.

The 135 hunters that reported their observations saw thirty-four wolverines; 15.6% of those hunters saw at least one wolverine. Wolverines were reported from zones S/OT/01, S/OT/04, S/OT/05, and G/OT/01.

Black Bear (Ursus americanus) and Grizzly Bear (U. arctos)

Non-residents purchased two black bear tags for the Mackenzie Mountains in 1998, but no bears were harvested. Black bears are relatively rarely sighted in the Mackenzie Mountains and in most years are more commonly reported from the southern outfitting zones (Veitch and Popko 1997; Veitch and Simmons 1998). In 1998, we received more reported sightings of black bears than in any of the previous four years (Table 10); however, all 15 black bears seen by hunters and reported to us were from the S/OT/05 zone in the centre of the range. It was also the first year that all black bears reported were adults.

The Mackenzie Mountains are not open to non-resident hunting of grizzly bears; however, as is clear from Appendix 1, grizzly bears compete with Dall's sheep and woodland caribou as the most discussed species of large mammals among our non-resident hunters and their guides. In 1998, 59.3% of those hunters that reported numbers of grizzly bears observed saw at least one bear (Table 10), which is down considerably from 75.8% in 1997 (Veitch and Simmons 1998), 97.7% in 1996 (Veitch and Popko 1997), and 89.1% in 1995 (Veitch and Popko 1996). However, the 411 grizzly bears reported in 1998 was up slightly from 376 in 1997 and down from 473 in 1996.

Again in 1998 we had a low cub to adult ratio from hunters' observations, with cubs comprising only 16.5% (Table 10). Since cub grizzlies in the Mackenzies tend to stay with their mothers for 3 years (Miller et al. 1982), 'cub' refers to cubs-of-the-year, yearlings, and 2-year-olds. In comparison to other northern grizzly bear populations, the proportion of the Mackenzie Mountain grizzly population that are cubs is very low (cf. Nagy et al. 1983, 1983). Miller et al. (1982) found that Mackenzie Mountain grizzlies have a very low reproductive rate, with cubs not produced by any females less than 8-years-old, a mean litter size of 1.8, and an average inter-litter interval of 3.8 years. It is not known if the persistent low proportion of cubs observed by non-resident hunters is a result of this low reproductive rate, mortality of cubs as a result of predation by mature males (Bunnell and McCann 1993), or some combination of these two factors.

Table 10. Black bear and grizzly bear observations reported by non-resident hunters in the Mackenzie Mountains, 1998.

	Black bear		Grizzly bear	
	Cub	Adult	Cub	Adult
Total number seen	0	15	68	343
Number of hunters reporting	121	124	139	177
Number of hunters that saw at least one	0	8	31	105
Mean number seen	0.0	0.1	0.5	1.9
Standard deviation	0.0	0.5	1.1	2.9
Maximum number seen	0	3	6	16
Percent of the total number seen	0	100	16.5	83.5

On the *Observation Report* form in 1998 we asked non-resident hunters for their opinion about whether or not they felt that grizzly bears are a problem in the Mackenzie Mountains (Figure 3). The hunter could choose to answer yes, no, or neutral. We received 197 responses to the question – of those, 62% said yes, 20% said no, and 18% were neutral. This was an interesting contrast with a survey of 39 resident hunters that had hunted Dall's sheep in the Mackenzie Mountains in 1996 – when asked the same question about grizzly bears, only 10% said yes and 90% said no (Veitch and Popko, unpublished data).

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We also greatly appreciate the efforts, interest, and co-operation shown by our visiting hunters and the more than 80 guides that completed the forms, reported observations of animals seen, and did the various antler and horn measurements. In addition we would like to particularly thank those hunters that took the time to write comments.

Lana Robinson (Sahtu GIS Project, Norman Wells) prepared the map of outfitting zones and Lynda Yonge (DRWED, Yellowknife) co-ordinated the final preparation of this manuscript. We appreciate both their efforts.

PERSONAL COMMUNICATIONS

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Appendix 1. Comments from non-resident hunters in the Mackenzie Mountains, NWT on voluntary *Hunter Wildlife Observation Report* forms, 1998.

Third consecutive hunt - just keeps getting better and better. Lots of game seen.

Once client saw what was required / type of terrain goat live in, he was uninterested in pursuing a hunt; very poor physical condition; lucky to get any sheep.

The wildlife was excellent. The animals were in very good condition. Our outfitter and his guides were very conscious of the environment.

Reason for not coming back – too old for these mountains. It is sure nice country and I enjoyed every minute I was here, but I know my limits.

Saw 13 legal rams. Got 3 shots with bow – missed all. Shots at 8-25 meters.

I feel that there are enough grizzly bears in the Mackenzie for limited draw licenses from what I saw and through talking with the other guides from XX.

Missed one shot at single wolf.

Bow hunter. Ram was shot at 28 yds.

Bow hunter. Ram was shot at 40 yds.

Short hunt. Did not have time to form opinion.

Ram harvested skinny and poor teeth.

Had an excellent hunt.

Missed 4 rams from 22-36 yds with a bow. Hunted the XXX mountains area. Did not kill a sheep.

Bad weather, few sheep on top, no bugs, rams in the bottoms. Missed ram 125 yds.

Seen rams moving through the area.

Swollen testicles due to some sort of infection from an outer hole (*Authors' note: we assume this refers to a Dall's sheep and not the hunter).*

Shot sheep with father on third day.

Shot sheep with daughter on third day. Ram had a busted face and palate was busted.

Nice place. Not too many mature sheep.

30-yard bow shot.

Too many bears - need to be thinned out. Show no fear - too aggressive to those unfamiliar - especially to hikers.

Lots of grizzly sign. Bears near camp.

XX excellent outfit. Very professional.

In 1996 when I was here, a saw over a dozen grizzlies. I feel the outfitters should have a few permits to keep the bear population in check.

Frequent grizzly bear encounters. Lots of bear sign. Lots of sheep and caribou. Grizzly bears were encountered frequently while hunting in both high country and in timbered areas. Good lamb crop - all sheep and caribou seemed to be healthy.

The game is excellent, top quality.

XX Outfitters are a first class operation. Seem to be very knowledgeable of the wildlife and habitat in their area.

XX does a good job especially good for someone new to the north.

Had been charged by one grizzly and another was thinking about it. Had a great hunt, seen lots of great game. Took a great sheep and had a chance at a great caribou bull. Got weathered in for 5 days, snow and fog.

Had a good hunt, seen lots of country. Weather was fair.

Hunt of a lifetime. Bears near camp lots of sign (scat) and tracks.

Excellent hunt!

Guide great and also XXX the pack dog saved me a trip back to the mountains.

Lots of wolves, guide was good!! His dog XXX was great!

The quality of my hunting experience was excellent. This is a beautiful place. I hope this place stays the same for future generations. This is a great area.

Game was plentiful. Outfitter and guide were excellent.

Tell Alasdair my experience in the territories was beautiful, just #&$@ beautiful!

Hope for grizzly season to control bear population. Otherwise, excellent.

I don't know if they are a problem or not but there are plenty of them. I think that consideration should be given to hunting them. (*Authors' note: we assume the hunter refers to grizzly bears and not biologists*).

XX outfitters are a first class operation from all aspects!

Great country, good people. Thanks.

Sheep densities overall seem to be quite even over the area covered. Ram to ewe ratio quite high.

The Mackenzie Mountains have some of the most beautiful basins and valleys I have ever seen. Untouched wilderness is excellent. The opportunity to go into untouched wilderness is great. The outfitter and his staff were excellent in helping me make my trip a once in a lifetime experience.

You need a grizzly season in this area. Any biologist will tell you this is a mature population and could stand limited hunting. Thanks.

Saw a lot of grizzly sign. However, always in the back of your mind you may see one at any time.

Grizzly sign throughout hunting area. Around camp as well.

Should consider opening a grizzly bear season in the Mackenzie Mountains. It appears that there are a large number of bears in this area.

Found all guides or equipment to be of very high proficiency.

Should have a grizzly bear season. Seen lots of quality game. Seen lots of different game and quality size horns from sheep to caribou. Seen 1 fox, two grouse, and good fishing. Seen 1 nice grizzly bear.

Very few calves/cow ratio.

Bears have become a liability. People are going to be hurt or killed. The bears have no natural fear of people or horses. The bears find a horse trail and follow it to hunting camps or kill sites where they cause problems. Limited hunting of bears should create enough natural fear that the bears could be less of a problem for all and then they wouldn't need to be needlessly shot in defence of life and limb.

Bears came to camp a lot.

Outfitter went out of his way to ensure my hunt was a success. Grizzly came into camp after garbage posed a problem.

We saw at least one different bear every day. They seemed to be in every valley we went into. I have never seen as many bears in an area. I do not feel the area I was in could support any more bears. I was hunting caribou and the caribou did not seem to be moving. Possibly due to late summer which changed their normal patterns.

A lot of grizzly sign was seen throughout the area we hunted.

Wolves had injured a small bull caribou and chased it into lake. Caribou swam lake twice to escape wolves.

A limited entry season on grizzlies would assist to 1) reduce problem bears that will likely be killed anyway and 2) put a measure of additional respect for the bears toward man.

There are lots of bears, very few moose or caribou calves. I feel that a bear season would teach the bears some respect, help eliminate problem bears, and increase the moose and caribou populations.

Excellent hunt.

Very good hunting, but abundance of bears and their apparent aggressive nature was somewhat unnerving, especially when hunting and travelling river bottoms. It is my belief that the abundance of grizzly plays a significant fact in poor calf crop of both moose and caribou.

Grizzlies. You must have a season for this renewable resource. Bear sign everywhere. Too many bears in camp and around camp.

Outfitter XX runs a well-organized business. His guides are very competent, friendly, and considerate.

Great hunt. Would like to go longer and into some country that has not been hunted for a long while. Guides, cooks, wranglers all excellent and put out more than necessary.

I feel that grizzly bears are problem.

Grizzly bears were very prominent. They came near camp every day and we had to leave at least one person there to chase them away. Every kill had bears on them by the following day. It made hunting progressively difficult.

Saw more bear than moose.

Enjoyed hunt, beautiful country, excellent outfitter with very enjoyable accommodations, great time.

The caribou we seen were fat and looked in good shape. We seen a grizzly on the 4th day of the hunt. We also seen a golden eagle with his mate on 3rd day of hunt. Had a really good time. Coming back next year.

The amount of bear sign we saw there should be a season

Excellent, hard work, great people, beautiful country, and fantastic food.

It seems we saw grizzly bears every drainage we went in. This is the first time in my hunting career of 20 years of big game hunting I seen so many bears.

Grizzly bear sightings were low but in the valley bottoms there were numerous tracks from different sized bears and with proper management there could be a successful hunting season on bears with no ill effects on their population.

Tremendous experience. Outfitter and guide are top notch. Efforts to please client/hunter are excellent.

Outfitter and guide extremely competent and professional – best hunting experience of my life.

Excellent hunt, all aspects. Please use me for a reference.

I believe that a non-resident quota would help control problems caused by bears - at the present time it seems they have no fear or respect for man. A season may help this.

Excellent sheep hunting trip. Lots of game and lots of grizzly sign.

Very excellent area. We only hunted 2 days and saw lots of sheep and a few caribou. The harvested ram was quite thin due to an abscessed lower jaw tooth.

There were bears in camp at base camp on this trail and above our hunting camp. With past experience I feel the bear population should be looked at closely.

High quality hunt, area, game. Plan on coming back.

Good hunting

Great hunting

Excellent hunting area, well managed camp, and staff very attentive to the game and game management.

Great trip, beautiful country, great outfitters, and guides. Very good sheep hunt.

Potential record book grizzly killed as camp pest. Give outfitter grizzly tags the same as natives so a renewable resource can be properly managed .

There should be a grizzly bear season.

Excellent country.

I saw a lot of game with my son. Thank you for the opportunity as a non-resident. I would like to hunt grizzly in the N.W.T. with this outfitter XX with whom I am comfortable. It would make revenue for your game programs and economy. Thank you for the opportunity to hunt.

Excellent Outfitter

XX Outfitters does a fine, fine job. Thanks.

My observation is that there are very few moose calves! Something is clearly happening to the young moose be it bears or wolves. There is considerable grizzly and wolf sign where ever I went. XX does an excellent job!!!!

Beautiful Country.

Quality of sheep seems to be excellent. Appears to be excellent lamb survival. Quality of hunt was superb.

Bear in camp 3 nights in a row.

Great hunt, great country, excellent outfitter.

XX provides an experience that is everything I expected and more!

There should definitely be a grizzly bear season.

If meat is not removed within 24 hours from kill site - bears get the rest. i.e. moose

You have a beautiful country. I was very impressive! Thank you!!!

Great hunting experience, excellent guides, great cooking. Beautiful scenery, good pilots.

Excellent outfitter, very experienced with flying, excellent guides, friendly people in Norman Wells, breathtaking scenery. A great hunting experience.

Great outfitter, great guide. A fantastic hunting experience.

Excellent hunt and area! Plan on returning.

This was the finest hunting experience of my life. XX Outfitter was very professional and represented the N.W.T. in an outstanding manner. See you in a few years!

One person I hunted with was charged by a grizzly, and another was bluff charged. Several grizzly bears were sighted by others.

A study of bear numbers [is needed] in the area as high experiences/encounters talking to other hunters. I lost my moose to a 7-8 foot grizzly and was not the only hunter – there are too many bears for their range thus food competition causes bears to seek other means of sustenance. Overall this has been one of the most enjoyable hunting

trips I've ever been on.

Very beautiful area and very excellent hunting. Although I never saw a bear on this hunt maybe they should consider hunting bears in these mountains.

The grizzly bears seem to have "no fear" of humans. Two of the 3 bears we saw got very close to us. One 30 yds, another 50yds.

Great area for hunting. Very pleased I choose to hunt in NWT and will return many times.

Although I seen no bears it was obvious that there are lots due to the tracks I saw. I think it would be a good idea to allow us to hunt your bears.

Had problems with bears in camp. Also bear smashed window in pick-up truck to take meat inside.

I had no close encounter with grizzlies, but my outfitter had several extremely dangerous situations involving grizzly.

I enjoyed the hunt and the outfitters very much.

Too many close calls with bears in camp

I did not see any bears, but heard there were problems at other camps this fall. The XX Outfitters treated me very well as a client, the country is spectacular. I had to leave early because my father had a stroke. But I hope to return.

I enjoyed my hunt and am taking many fond memories back with me. I like your wildlife management. Also my outfitter (XX) and guides.

The bears in this area have no respect nor fear of humans and I feel there should be a season to weed out these aggressive bears to make these mountains reasonably safe for bow hunters, hunters, and hikers to enjoy. I also feel it should be a requirement for all guides to carry guns at all times.

I lost my moose to a grizzly and encountered four others. They were around camp and were encountering them while hunting. Too many bears. If I don't return to your NWT it will be because of grizzlies.

Information on bears second-hand, based on talks with guides, other hunters, evidence (tracks and sign). As a biologist from Idaho, the information points to a large bear population - and based on my previous trip to the southern NWT, things seem to be reaching problem proportions.

Great hunt. Great country!

Great hunt. Great Territory.

Saw many grizzly bears! Too many grizzly bears.

I noticed a large amount of adult bears with no cubs. I feel by protecting the adult bears you are eliminating almost all the cubs, which will bring dramatic effects to bear numbers as there are no upcoming offspring. Shoot some bears, save the species.

Need a grizzly bear season

I enjoyed my trip in the Mackenzie Mountains. The scenery was great and good quality of wildlife.

Bears should have a season to be hunted as a lot of sign has been observed.

My guide was required to go up a tree to avoid a bear. Husband's moose cape was destroyed by bear.

The bears are out of hand totally. Your problem bears are everywhere and are a hazard. The last time I was in the N.W.T. while trying to cape out moose was forced off course by a bear. This time had a bear in camp. This time the bear got my cape at night in XX camp. It was in a tree and salted. I will not hunt or visit the N.W.T. again until a grizzly bear season is set to deal with problem bears in remote areas. Over the past 10 years this problem has just gotten worse and worse and worse. I will hunt in the Yukon where they have their bears in control. You have no management of your grizzly bears – none. And further I do not think you have any knowledge of the number of bears you have. Far too many problem bears that would be removed if a few permits were given to dispose of the problem bears. (*Authors' note: this hunter has hunted in NWT seven times*).

Although only one bear was sighted, there was lots of evidence that there are a lot of bears around and are taking a toll on the hunting species.

To many bears

XX was a great credit to the outfitters' association and the country of Canada. Had a great experience.

Other hunters in XX camp had encounters with grizzly bears and everywhere I hiked there were grizzly tracks to be found. A grizzly bear season would be a wise move.

Bear track and droppings on every trail.

There are too many grizzly bears around. At one camp, we had two different bears within 1/4 of a mile. At another camp, a grizzly kept coming into camp and after scaring it away several times it had to be killed. I believe a season should be established to harvest some of the grizzly bears.

Should have a season on grizzly bears as the population of bears seems to be very high.

Too many grizzlies - big problem while hunting.

Caribou not moving - no large bulls. I am not in favour of the the new Firearms Act and do believe this will detour hunting in your country.

One grizzly in camp - ate a lot of meat! Was not easy to chase off! Would keep coming back.

System appears to be properly managed. Everyone I have met here was courteous, knowledgeable, and enjoyable. Who could ask for more?

I feel grizzly bears should be controlled they are becoming a problem. I was hunting this same area in 1996 and bears are much worse now than 1996 and I felt it was bad then.

Too many bears, too close; every year we have repaired equipment. Overall I have seen 13 adult grizzlies. Way too many!

Weather very warm - caribou were not migrating heavily. In addition - I am not in favour of the new Firearms Act, which will discourage Americans.

Great hunt! I have hunted in both BC and Yukon, and NWT has been the best! So much game and the scenery was spectacular. The Mackenzie Mountains are a definite must for anyone looking for a good hunt with abundant game. XX Outfitters is a first class operation. Camps are clean and guides hard working and know what they are doing. Outfitter is very professional

There is a lot of grizzly bears in this region almost to the point of a problem. Some of these bears could easily be taken to control the population

We had a very good hunt!!! Everything was great! The weather was great, the guides were great. The food was great!!! Lots of fun!!! Thanks for a good time!!

Super hunt! Excellent guides, excellent outfitter!

Very good hunt. XX is a good outfit.

Plenty of healthy game. This was a great hunt. A lot of game, 4 bears.

Too many bears. A hunting season would be beneficial to this area.

Lots of grizzlies, going to be a big problem. Lost lots of meat.

Lots of game (sheep and caribou) seen. Very good guides and services provided. Made for good hunt.

It's nice seeing the grizzly bear, but they are becoming a problem around all of the camps that we were in. This was my first time in the N.W.T. and I thoroughly enjoyed myself.

Very nice organization XX. Very good guides, food, horses. The grizzly bears is a very big problem in the camp.

We constantly had grizzly bears in camp, which provided an unsafe situation for the clientele. There was a lot of sign also on the game trails while hunting, also individual sighting while hunting on hillsides.

The sheep herd appears to be very healthy with an adequate number of older rams (9-11 years) to assure normal reproduction. The flora of the range is of excellent quality. No wolves sighted, but lots of tracks seen. Lamb numbers appear normal for the population.

[Grizzly bears] may not be a problem yet - but it will happen as there is plenty of sign on trails and at campsites!

Open a grizzly bear season for non-resident alien hunters. There are plenty of bears to support a hunting program.

Bears are a problem when hunting and camping. There were three at camp. They were too close to the tent for me. Good thing that XX and his guides were there.

I am employed as a guide by XX and feel that the grizzlies are a very dangerous obstacle around camp and while hunting.

Appendix 2. Outfitters licenced to provide services to non-resident hunters in the Mackenzie Mountains, NWT - 1998

G/OT/01 – *ARCTIC RED RIVER OUTFITTERS*
Kelly and Heather Hougen
P.O. Box 5988
Whitehorse, YT
Y1A 5L7
Ph: 867-633-4934
Fx: 867-633-4934

S/OT/01 – *GANA RIVER OUTFITTERS*
Bill and Carol McKenzie
P.O. Box 4659
Quesnel, BC
V2J 3J8
Ph: 1-800-661-0702
Fx: 250-992-8639

S/OT/02 - *MACKENZIE MOUNTAIN OUTFITTERS*
Stan and Helen Stevens
P.O. Box 5
Tomslake, BC
V0C 2L0
Ph: 250-786-5118
Fx: 250-786-5118

S/OT/03 – *RAM HEAD OUTFITTERS*
Stan and Debra Simpson
P.O. Box 89
Warburg, AB
T0C 2T0

S/OT/04 - *NWT OUTFITTERS*
Darrell and Duane Nelson
P.O. Box 1154
Glenwood, AB
T0K 2R0
Ph: 403-626-3643/3279
Fx: 403-626-3036

S/OT/05 - *REDSTONE TROPHY HUNTS*
David and Carol Dutchik
P.O. Box 621
Cochrane, AB
T0L 0W0
Ph: 403-932-2624
Fx: 403-932-2624

G/OT/01 – *NAHANNI SAFARIS*
Rick Furniss
11 Harbottle Road
Whitehorse, YT
Y1A 5T5
Ph: 705-789-5754
Fx: 705-789-9514

G/OT/02 – *NAHANNI BUTTE OUTFITTERS*
Cam and Clay Lancaster
3 Athabaska Way
Lethbridge, AB
T1K 7A6
Ph: 403-380-2789
Fx: 403-380-6126

Association of Mackenzie Mountain Outfitters
c/o Kelly Hougen, President
P.O. Box 5988
Whitehorse, YT
Y1A 5L7
Ph: 867-633-4934
Fx: 867-633-4934

Appendix 3. Number, age, and horn length measurements of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 1965-1998.

Year	Number of Sheep Harvested	Age (Years)		Length of Right Horn (cm)	
		Mean	Sample Size	Mean	Sample Size
1967-1968	168	8.4	Unknown	86.4	168
1979	200	-	-	90.7	159
1980	180	-	-	89.9	127
1981	187	8.1	101	93.7	157
1982	126	8.7	98	89.7	124
1983	100	9.0	80	90.9	94
1984	102	8.4	98	91.2	99
1985	123	8.1	115	89.7	112
1986	154	8.8	132	88.4	153
1987	148	8.9	148	89.4	148
1988	177	9.8	166	91.7	161
1989	207	9.9	199	90.4	203
1990	219	9.8	200	90.2	218
1991	170	9.7	161	89.1	170
1992	203	9.7	199	88.0	202
1993	191	9.7	181	87.6	190
1994	195	9.5	191	88.6	196
1995	190	9.7	189	89.3	189
1996	201	9.5	200	88.8	201
1997	207	10.0	207	89.9	200
1998	215	10.0	207	90.0	209

Appendix 4. Horn and antler measurements for 1979-90 and 1995, 1996, 1997, and 1998 for ungulates harvested by non-resident hunters in the Mackenzie Mountains. (All measurements are in centimetres unless otherwise shown and the sample size is given in brackets).

Measurement	1979 – 1990 mean	1995	1996	1997	1998
Dall's sheep right horn length	90.4 (1755)	89.3 (189)	88.7 (201)	90.3 (203)	90.0 (209)
Dall's sheep horn annuli age (yr)	9.5 (1755)	9.7 (189)	9.5 (200)	10.0 (203)	10.0 (207)
Woodland caribou right antler length	114.5 (1037)	116.5 (171)	116.3 (128)	116.2 (131)	113.9 (106)
Moose antler spread	139.8 (236)	143.7 (47)	142.4 (29)	147.2 (33)	142.4 (36)
Mountain goat right horn length	20.3 (17)	21.4 (5)	17.5 (2)	21.8 (2)	18.2 (5)

Appendix 5. Outfitted non-resident hunter harvests in the Mackenzie Mountains, 1991-1998.

Year	Number of licences sold	Dall's sheep	Woodland Caribou	Moose	Mountain goat	Wolf	Wolverine
1991	354	170	179	40	6	14	3
1992	364	203	142	32	4	7	0
1993	382	191	191	56	9	7	3
1994	356	199	164	46	5	15	2
1995	344	190	180	49	6	14	1
1996	387	201	175	46	4	11	4
1997	352	210	168	44	2	17	1
1998	345	215	160	52	5	9	0
Mean 1991-98	361	197	170	46	5	12	2

Appendix 6. Summary of age and sex ratios calculated from non-resident hunter observation reports in the Mackenzie Mountains, 1995-1998.

Year	Dall's Sheep		Woodland Caribou		Moose	
	Lambs: 100 Ewes	Rams: 100 Ewes	Calves: 100 Cows	Bulls: 100 Cows	Calves: 100 Cows	Bulls: 100 Cows
1995	67	82	36	34	30	95
1996	44	82	45	40	26	76
1997	57	55	36	21	30	107
1998	60	84	36	34	30	95